"Science, Society and America's Nuclear Waste" is a four-unit secondary curriculum. It is intended to provide information about scientific and societal issues related to the management of spent nuclear fuel from generation of electricity at nuclear powerplants and high-level radioactive waste from U.S. national defense activities. The curriculum, supporting classroom activities, and teaching materials present a brief discussion of energy and electricity generation, including that produced at nuclear powerplants; information on sources, amounts, location, and characteristics of spent nuclear fuel and high-level radioactive waste; sources, types, and effects of radiation; U.S. policy for managing and disposing of spent nuclear fuel and high-level radioactive waste and what other countries are doing; and the components of the nuclear waste management system. The four units are:

Unit 1 - Nuclear Waste

Unit 2 - Ionizing Radiation

Unit 3 - The Nuclear Waste Policy Act

Unit 4 - The Waste Management System

In the study of nuclear waste management, or any other scientific and social subject, individuals are encouraged to seek differing perspectives and points of view.

This resource curriculum was produced by the U.S. Department of Energy's (DOE) Office of Civilian Radioactive Waste Management (OCRWM) and has been reviewed by selected staff, faculty, and/or workshop participants from: Louisiana State University; the University of Nevada, Reno and Las Vegas; the University of Tennessee; Pennsylvania State University; Hope College in Michigan; the University of South Florida School of Medicine; the New York State Department of Education, Science, Technology, and Society Education Project; the Nevada Science Project; the National Council for the Social Studies, Science and Society Committee; and the First International Workshop on Education in the Field of Radioactive Waste Management — At the Crossroads of Science, Society, and the Environment — co-sponsored by the multinational Organization for Economic Cooperation and Development/ Nuclear Energy Agency, U.S. Department of Energy's OCRWM, and the Swiss National Cooperative for the Storage of Radioactive Waste (NAGRA). The international workshop was attended by educators and information specialists from Austria, Belgium, Canada, Finland, France, Germany, Japan, the Netherlands, Spain, Sweden, Switzerland, the United Kingdom, and the United States. This curriculum was field tested through team-teaching by science and social studies teachers in Alabama, Florida, Georgia, Louisiana, Mississippi, South Carolina, and Texas.

For further information about this curriculum, please call 1-800-225-6972 (within Washington, DC, 202-488-6720) or write to:

OCRWM National Information Center
Attention: Curriculum Department
600 Maryland Ave., SW
Suite 760
Washington, DC 20024

The 1977 DOE Reorganization Act authorizes education and training activities necessary to ensure that the Nation has an adequate technical work force in energy-related research and production fields. These fields include mathematics, physics, geology, chemistry, zoology, biology, and other areas of basic and applied research. The DOE Science Enhancement Act (part of the 1991 National Defense Authorization Act) expands the Department's authorization to support science education and amends the 1977 legislation to make support for science education a major mission of the Department. Traditionally, the DOE educational emphasis has been on university-level education, with the agency providing graduate student fellowships and research appointments at DOE facilities. More recently, the education mission was expanded to include precollege education and science literacy.

DOE has been working diligently to make its contribution toward achieving our National Education Goals since their development following the 1989 Education Summit in Charlottesville, Virginia. Although DOE's work indirectly supports all the goals, DOE is especially involved in Goal # 4: "By the year 2000, U.S. students will be first in the world in science and mathematics achievement."

DOE sponsors a number of national and local energy education programs, in addition to this curriculum, through its national laboratories, energy technology centers, and various DOE program elements. For further information about these programs, please write to: U.S. Department of Energy, Office of Science Education and Technical Information, Washington, DC 20585.

Science, Society, and America's Nuclear Waste

Nuclear Waste

Unit 1 Second Edition
Teacher Guide

July 1995

Department of Energy
Washington, DC 20585

To the Teacher:

This Second Edition of the Teacher Guide accompanies the resource curriculum *Science, Society, and America's Nuclear Waste*. The curriculum, produced by the United States Department of Energy's (DOE's) Office of Civilian Radioactive Waste Management (OCRWM), is designed to assist science and social studies teachers in presenting issues related to the safe management and disposal of America's nuclear waste. The curriculum was developed, reviewed, and tested by teachers for use in grades 8 through 12.

The *Science, Society, and America's Nuclear Waste* curriculum provides information and background on energy and waste-management issues. It is suitable for use in technology and environmental science classes and in social studies classes in middle, high school, and advanced lower grades. Its content and focus are consistent with national goals to strengthen and update math and science curriculum and broaden public science literacy.

Since the curriculum was first made available to the public in 1992, and as of August 1995, more than 20,000 Teacher Guides and approximately 200,000 Student Readers have been requested by and distributed to educators of diverse disciplines in all 50 States and in 48 foreign countries.

Ancillary materials, such as videotapes, a computer diskette, and other materials referenced in the document, may be obtained by calling the OCRWM National Information Center at 1-800-225-6972 (in Washington, D.C., 202-488-6720).

Sincerely,

E. J. Deshields

Evangeline Deshields, Manager
Office of Civilian Radioactive Waste Management
National Information Center

Notice To Educators

These **Second Edition Teacher Guides** contain statistical updates that are current as of October 1, 1994. **First Edition Student Readers** are available upon request. Since very few statistical changes were required in the Student Readers, **Second Edition Student Readers** were not printed. Minor differences between the two editions are underlined in your Student Reader material contained in these Teacher Guides.

References to a Monitored Retrievable Storage (MRS) Facility and the Office of the Nuclear Waste Negotiator

You will note that throughout units 3 and 4 of the curriculum references are made to the concept of a Monitored Retrievable Storage (MRS) facility. The Nuclear Waste Policy Amendments Act of 1987 (the Act) authorized the siting, construction, and operation of such a storage facility as an integral part of the Federal waste management system. The Act gave the Secretary of Energy the authority to survey and evaluate sites for a storage facility then designate one. The Act also created the Office of the Nuclear Waste Negotiator to seek a State or Indian Tribe willing to volunteer a technically suitable site, under reasonable terms to be approved by Congress.

To counter a concern that interim central storage on the surface might become permanent, Congress linked the selection of a storage site to the recommendation of a repository site to the President by the Secretary. Under this limitation, construction of a storage site cannot begin until the Nuclear Regulatory Commission issues a license for construction of a repository. In 1989, the Department of Energy announced a delay in the recommendation of a repository site until 2001, and a delay in the expected date of repository operations until the year 2010. The Secretary also told Congress that if the linkage between the MRS facility and the repository were modified, then waste acceptance at the facility could begin by 1998. This was based on the assumption that a site would be available by then. However, the linkage remains in place, the Nuclear Waste Negotiator has not been able to find a volunteer candidate site, and accumulated political experience suggests that a volunteer site for interim storage is not likely. In the absence of interim central storage, waste acceptance and offsite transport could not occur until the start of repository operations in 2010.

The Fiscal Year 1995 budget does not provide funding to OCRWM for activities related to interim storage, and the statutory authority for the Office of the Nuclear Waste Negotiator expired in January 1995. However, references to an MRS facility are still included in the Second Revision, as the concept is still included in the Nuclear Waste Policy Act, as mentioned.

Because of the changes mentioned above, this edition's lesson in Unit 4, formally titled *The Role of the Monitored Retrievable Storage Facility*, has been replaced with the lesson *The Role of the Multi-Purpose Canister*. However, most of the other references to an MRS facility found throughout the curriculum have remained intact, most notably in Unit 3. Please take special note of this new information as you plan lessons around the concept of an MRS facility.

Please note that referenced videotapes and support materials can be obtained free of charge through the **OCRWM National Information Center at 1-800-225-6972 (in Washington, DC, 202-488-6720).**